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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

(Attorney Docket No. 12455ROUS02U)

In the Application of:

Strawczynski et al.

Serial No.: 09/835,102

Filed: April 13, 2001

For: Servicing Multiple High Speed Data
Users in Shared Packets of a High Speed
Wireless Channel

§ Group Art Unit: 2681

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§ Examiner: Unknown

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CERTIFICATE OF FIRST CLASS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service First Class Mail, postage prepaid, under 37 C.F.R. Sec. 1.8(a) addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on July 18, 2001.

Bruce E. Garlick

SUBMITTAL OF PRIORITY DOCUMENT (FOREIGN PATENT APPLICATION)

Assistant Commissioner for Patents
Washington, D.C. 20231

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JUL 27 2001

Dear Sir:

Technology Center 2600

Enclosed herewith is a Certified Copy of Canadian Patent Application 2,305,040, filed on April 13, 2000, to which the present application claims priority.

Respectfully submitted,

Date: July 18, 2001

By:

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Specification as originally filed with Application for Patent Serial No: 2,305,040, on April
13, 2000 by **NORTEL NETWORKS CORPORATION**, assignee of Leo L.
Strawczynski and Wen Tong for: **Multiplexing Users on Forward Data Channels in High
Data Rate System**

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May 30, 2001

Date

Canada

(CIPO 68)
01-12-00



ABSTRACT OF THE DISCLOSURE

- 5 A high data rate (HDR) cellular system designed for data rate users identifies multiple users who may be multiplexed within a high data rate forward traffic channel packet. A new preamble is defined to signal the data rate of the transmission and the identities of the multiple recipients. By multiplexing users on forward data channels in high data rate systems,
- 10 the system is more efficient. Also, it achieves an efficient addressing to identify multiple users within the data packet.

*** TOTAL PAGE.10 ***

MULTIPLEXING USERS ON FORWARD DATA CHANNELS IN HIGH DATA RATE SYSTEMS

TECHNICAL FIELD

5

The present invention relates to a high data rate cellular systems and in particular to a method for multiplexing users on forward data channels in high data rate systems.

10 BACKGROUND ART

High data rate (HDR) cellular systems designed for data rate users have been proposed by Qualcomm (corporate name). Detailed specifications of the HDR cellular systems are disclosed in the submission
15 "HDR Air Interface (HAI) Specification" of 2000.03.20. In the proposed systems, the forward traffic channel encoder packet is not designed to accommodate multiple users. If a user does not require all of the packet to send information, the rest of the packet will be redundant. Particularly at the higher data rate ranges (e.g., $> 614\text{kb/s}$), an opportunity exists to
20 improve the system efficiency and increase the system capacity. As such, there is also no convenient addressing method proposed for the identification of multiple users who may be multiplexed within a high data rate forward traffic channel packet. Further, there is no proposed method to signal the data rate to the access terminal, since the design is to
25 provide only those data rates on the forward link as requested by the access terminal (AT).

SUMMARY OF THE INVENTION

30 It is an object of the present invention to provide a method for multiplexing users on forward data channels in high data rate systems. To make the system more efficient, the present invention proposes that users may be multiplexed within a forward data channel encoder packet. Also, the present invention proposes an efficient addressing method to identify
35 multiple users within the data packet. Furthermore, the present invention proposes a method to signal the data rate to the AT such that the AT can now accept any data rate equal to or lower than that requested by it.

Changes proposed will impact the forward traffic preamble portion of the HDR forward traffic channel.

According to the most general aspect of the present invention, there is provided a method for multiplexing users on forward data channels in
5 high data rate systems, the method comprising the step of: when a relatively small amount of data w.r.t. packet size at very high data rates is transmitted, leaving the remaining packet is not empty or filled with redundant data.

The method may comprises the steps of: using the remaining
10 packet efficiently to include the data from other users; if a user at a higher data rate is given an opportunity to utilize such a packet at a lower data rate, multiplexing the higher data rate user's transmission into the packet; and defining a new preamble to signal the data rate of the transmission and the identities of the multiple recipients.

15 The present invention enhances the proposed HDR systems to enable efficient transmission of data on the forward link, so as to maximize the capacity and utilization of the forward link. The higher capacity will enable more users to access the system and will also reduce the overall delay in delivery of the recipient's data. The present invention
20 supports multiple users on the forward traffic channel in the proposed HDR systems.

DETAILED DESCRIPTION

25 Embodiments of the present invention will now be described by way of example only. Embodiments of the present invention are applied into the proposed HDR cellular systems described in "HDR Air Interface (HAI) Specification" of 2000.03.20. The specifications are incorporated herein by reference.

30 The proposed HDR system, transmission on the Forward traffic channel (FTC) is TDM. At any given time, the channel is either being transmitted or not, and if it is being transmitted, it is addressed to a single user. When transmitting the FTC, the access network users a MACIndex-dependent preamble to identify the target access terminal (pp. 8-29,
35 Section 8.4.5.3, HAI2000.03.20). A preamble sequence (pp. 9-51, section 9.3.1.3.2.3.1, HAI2000.03.20) is transmitted with the ach traffic channel packet in order to assist access terminal synchronization with the first slot

of each variable rate transmission. The preamble is time-multiplexed into the traffic channel stream at the beginning of the first slot of the packet being transmitted. The preamble sequence consists of unmodulated BPSK, covered by a particular 32-ary Walsh function, repeated several times
 5 depending on the data rate of the packet. For user data, the preamble is covered with the Walsh function $W_{i,32}$ where i is the MACindex of the access terminal for which the data is destined. The preamble Walsh cover which is 32 chips long is transmitted preamble_repetition times according to the data rate of the associated traffic channel packet, as specified in
 10 Table 9-22 pp. 9-52 HAI2000.03.20). The definition of the preamble restricts the use of the traffic channel by a single user at a rate defined by the AT.

It is proposed that when a user is transmitting a relatively small amount of data w.r.t. packet size at very high data rates, the remaining
 15 packet should not be left empty or filled with redundant data, but used efficiently to include the data from other users. It is also proposed that if a user at a higher data rate is given an opportunity to utilize such a packet at a lower data rate, the higher data rate user's transmission can be multiplexed into the packet.

20 The embodiment of the present invention defines a new preamble to signal the data rate of the transmission and the identities of the multiple recipients as follows:

Modulation Phase	Chip Duration		
	64	32	32
I	X	WC_1	WC_2
Q	EDRI	WC_3	WC_4

(WC= 32-ary Walsh identifier)

25

The Explicit data rate indication (EDRI) is (8,4,4) code. The preamble proposes that the 64 chip preamble sequence on the I channel be enhanced with an additional 64 chip sequence. This sequence will then carry the MACindexes of 2 users as 32 chip Walsh functions. Similarly, the
 30 Q channel will carry MACindexes of 2 additional users. The EDRI is also multiplexed into the 64 chip sequence of the Q channel. Thus - 4 user addresses may be multiplexed in an encoder packet - the data rate to the

- AT may be different from that requested by the AT and indicated in the EDRI. The data rate transmitted should be equal to or lower than the data rate requested by the AT. Up to four users' data identified by the WCs may then be multiplexed into the forward traffic channel. The users' data
- 5 is also separated by an independent CRC to verify the reception of the data, so that the erroneously received user packets are requested to be retransmitted. The method is employed only when the forward traffic channel data rates are high (e.g., >614.4 kbps). At lower data rates, the traditional preamble sequence is used.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for multiplexing users on forward data channels in high data rate systems, the method comprising the step of:
 when a relatively small amount of data w.r.t. packet size at very high data rates is transmitted, leaving the remaining packet is not empty or filled with redundant data.
2. The method of claim 1, further comprising the step of:
 using the remaining packet efficiently to include the data from other users.
3. The method of claim 1 or 2, further comprising the step of:
 if a user at a higher data rate is given an opportunity to utilize such a packet at a lower data rate, multiplexing the higher data rate user's transmission into the packet.
4. The method of claim 1, 2 or 3, further comprising the step of:
 defining a new preamble to signal the data rate of the transmission and the identities of the multiple recipients as follows:

Modulation Phase	Chip Duration		
	64	32	32
I	X	WC_1	WC_2
Q	EDRI	WC_3	WC_4

(WC= 32-ary Walsh identifier)

- wherein the EDRI is an explicit data rate indication.

5. The method of claims 4, wherein the EDRI is (8,4/4) code.